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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|-----------------------|
| 10/717,268 | 11/19/2003 | Jozef Brcka | TAZ-248 | 7396 |
| 37694 | 7590 | 07/06/2006 | EXAMINER | |
| WOOD, HERRON & EVANS, LLP (TOKYO ELECTRON) 2700 CAREW TOWER 441 VINE STREET CINCINNATI, OH 45202 | | | | DHINGRA, RAKESH KUMAR |
| ART UNIT | | PAPER NUMBER | | |
| | | 1763 | | |

DATE MAILED: 07/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|------------------------|---------------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 10/717,268 | BRCKA ET AL. | |
| | Examiner | Art Unit | |
| | Rakesh K. Dhingra | 1763 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 10 May 2006.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-4,6,11-13,15,17 and 22-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-4,6,11-13,15,17 and 22-24 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 05/10/06 is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

| | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims 1- 4, 6, 11-13, 15 and 17 have been considered but are moot in view of the new ground(s) of rejection as explained hereunder.

Applicant has amended independent claims 1, 11 and added new independent claim 22 and dependent claims 23, 24.

New references (Pu et al – US Patent No. 6,273,022 and Brcka - US PGPUB No. 2001/0022158) have been found that when combined read on independent claims 1, 11, 22 limitations. Accordingly independent claims 1, 11, 22 and dependent claims 12, 13, 17, 23, 24 have been rejected under 35 USC 103 (a) as explained below. Further, remaining dependent claims 2-4, 6, 15 have also been rejected under 35 USC 103 (a) as explained below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were

made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 11-13, 17, 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pu et al (US patent No. 6,273,022) in view of Brcka (US PGPUB No. 2001/0022158).

Regarding Claim 1: Pu et al teach an inductively coupled plasma apparatus (Figures 1-4, 8-10) for processing a semiconductor wafer (not shown) that includes a vacuum chamber with a dielectric lid (wall) 10, a coil array (peripheral ionization source) antenna) 30 that includes RF antenna on the atmospheric side of chamber, and where the array 30 has segmented configuration with coils 40, 42 arranged in a ring form and positioned to couple power through the dielectric chamber wall into the chamber to produce a plasma. Pu et al also teach that currents in coils 40, 42 are configured so that adjacent coils produce magnetic field of opposite polarity (alternating high and low power distribution). Pu et al further teach that depending upon distance D (Figure 2) strength of magnetic field in the center of coil array 30 can be controlled. Pu et al also teach that plasma density distribution can be controlled by changing /optimizing factors like diameter of antenna coil, penetration distance, distances H, W (Figures 2, 5), besides distance between the antenna and the workpiece (Column 4, line 5 to Column

5, line 25 and Column 5, line 65 to Column 8, line 40 and Column 9, lines 5-50 and Column 12, line 10 to Column 13, line 65).

Pu et al teach all limitations of the claim including use of a conventional shield between induction coil array and chamber interior but do not teach a protective shield having slots there through and being configured to inhibit the deposition of material from the chamber onto the vacuum side of the dielectric chamber wall and to facilitate inductive coupling of RF energy from the antenna through the shield and into the chamber.

Brcka teach an ICP source apparatus (Figures 1D) for producing a high-density inductively coupled plasma in a processing space 14 for processing a semiconductor wafer 18 therewith, the source comprising:

a dielectric chamber wall formed of at least one section 24a of dielectric material (window) and having a vacuum side and an atmospheric side;
a peripheral ionization source including an RF coil assembly (antenna) 10 on the atmospheric side of the dielectric chamber wall, and a deposition baffle/shield (protective shield) 15 on the vacuum side of the dielectric chamber wall. Brcka further teach that shield 15 has plurality of slots 23 that can be configured as per shape of antenna elements. Further, the shield being configured to inhibit the deposition of material from the chamber onto the vacuum side of the dielectric chamber wall and to facilitate inductive coupling of RF energy from the antenna through the shield and into the chamber are inherent functions of the shield which the apparatus of prior art is normally capable of performing. Brcka also teaches that apparatus can use inductive elements with segmented configuration and arranged in a ring form (Figures 6B-6D)

that have low inductance and can enable generate ring (annular) shaped plasma distribution (paragraphs 0060-0064, 0098-0103).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use shield with slots configured as per antenna elements as taught by Brcka in the apparatus of Pu et al to achieve proper inductive coupling of RF energy from the antenna to the inside of process chamber.

Regarding Claims 11: Pu et al in view of Brcka teach all limitations of claim as explained above including that segmented antenna (Figures 6A-D, Brcka) has low inductance, and that coil array comprises of copper wire (conductor) 43 with plurality of coils (windings) 40, 42 wound around coil form 50 and have alternating low and high radiation segments as explained above, and the coil segments 40, 42 are arranged in a ring positioned to couple power into the chamber in alternating high and low power distribution (Column 4, line 5 to Column 5, line 25 and Column 5, line 65 to Column 8, line 40 and Column 9, lines 5-50 and Column 12, line 10 to Column 13, line 65).

Regarding Claims 12,13, 24: Pu et al teach that design of coils 40 and 42 including their size, spacing, number of turns, diameter of coil array can be optimized depending upon size/shape of chamber, location of workpiece and other process considerations (Column 5, line 50 to Column 9, line 65 and Column 15, lines 1-68).

Further, regarding optimization, courts have held (Case law):

“Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. It would have been obvious to one having ordinary skill in the art to have determined the optimum values of the

relevant process parameters through routine experimentation in the absence of a showing of criticality. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955)."

Regarding Claim 17: Pu et al in view of Brcka teach all limitations of the claim including that the apparatus is a semiconductor wafer processing apparatus (Brcka – paragraph 0059 and Pu et al - Column 1, lines 15-17).

Regarding Claims 22, 23: Pu et al in view of Brcka et al teach all limitations of the claims as explained above under claim 1, including that segmented antenna (Figures 6A-6D) have low inductance and can produce stationary ring shaped plasma distribution (Brcka, Paragraphs 0098-0103).

Claims 2, 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brcka (US PGPUB No. 2001/0022158) in view of Pu et al (US Patent No. 6,825,618) as applied to Claims 1, 11 and further in view of Davis et al (US Patent No. 6,685,799).

Regarding Claim 2: Pu et al in view of Brcka teach all limitations of the claim including that orientation of slots 23 in shield 15 can be configured as per shape of antenna elements but do not teach shield having segmented configuration with alternating low and high transparency sections.

Davis et al teach an apparatus (Figure 1) that includes a shield 40 for an inductive plasma apparatus. Davis et al further teach that shield 300 (Figure 3) can have segmented configuration and where each segment 320 can be individually configured for variable efficiency (transparency). Davis et al also teach that the invention also applies to plate type shields with segmented configuration (Figures 8-11), {Column 4, line 65 to Column 5, line 40 and Column 6, line 85 to Column 8, line 30).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use shield with segmented configuration as taught by Davis et al in the apparatus of Pu et al in view of Brcka to provide variable shielding efficiency (Column 2, lines 5-10).

Regarding Claim 15: Davis et al teach as explained above, a shield with segmented configuration of alternating high and low transparency sections arranged in a ring {Column 4, line 65 to Column 5, line 40 and Column 6, line 85 to Column 8, line 30}. Further, Pu et al teach as explained above, an antenna with high and low radiation sections (Column 4, line 5 to Column 5, line 25 and Column 5, line 65 to Column 8, line 40 and Column 9, lines 5-50 and Column 12, line 10 to Column 13, line 65). It would be obvious to one of ordinary skill in the art to align the shield so as to facilitate the coupling of power through the dielectric chamber such that the high-radiation segments of the peripheral ionization source (antenna) having included therein the high-transparency sections of the shield and the low-radiation segments of the coil array (peripheral ionization source) including the low-transparency sections of the shield, the high-efficiency segments of the coil array being aligned with the high- transparency sections of the shield and the low-efficiency segments of the coil array being aligned with the low-transparency sections of the shield.

Claims 3, 4, 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pu et al (US Patent No. 6,272,022) in view of Brcka (US PGPUB No. 2001/0022158) and Davis et al (US Patent No. 6,685,799) as applied to Claim 22 and further in view of Todorov et al (US PGPUB No. 2003/0006009).

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Regarding Claims 3, 4: Pu et al in view of Brcka and Davis et al teach all limitations of the claim except shield having slots for high transparency sections and generally electrically conductive solid for low transparency sections.

Todorov et al teach an apparatus (Figures 2, 5, 6) that includes a plasma chamber 111 with a shield 120A that includes plurality of radially extending slots 112 (high transparency sections) in between plurality of copper conductors 211 (low transparency sections) {Paragraphs 0026, 0030, 0031}. Todorov et al also teach that shield 120A is flat and circular.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use shield having slots for high transparency sections and generally electrically conductive solid for low transparency sections as taught by Todorov et al in the apparatus of Pu et al in view of Brcka and Davis et al to provide desired RF coupling and also to minimize eddy current losses (Paragraph 0032).

Regarding Claim 6: Brcka teaches that apparatus can function as an ionized physical vapor deposition (IPVD) apparatus (paragraph 0059).

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., In re Berg, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); In re Goodman, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); In re Longi, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); In re Van Ornum, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); In re Vogel, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and In re Thorington, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claim 1 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over Claims 28-30, 37-39, 58-63 of U.S. Patent No. 6,237,526 in view of Pu et al (US Patent No. 6,825,618).

Claims 28-30, 37-39, 58-63 of the patent teach an apparatus for producing an inductively coupled plasma in a vacuum chamber for processing a semiconductor wafer therewith, the source comprising:

a dielectric chamber wall formed of at least one section of dielectric material (window) and having a vacuum side and an atmospheric side;
a plasma source including an RF coil assembly (antenna) with segments in a ring form and on the atmospheric side of the dielectric chamber wall, and a deposition baffle/shield (protective shield) with slots on the vacuum side of the dielectric chamber wall.

Claims 28-30, 37-39, 58-63 do not teach the ionization source (coil) having alternating high and low radiation segments.

Pu et al teach an inductive plasma apparatus (Figures 1, 3, 8, 9) that includes a plasma chamber with a dielectric lid 10, a coil array (antenna) 30 with coils 40, 42 such connected that alternating coil segments are arranged in a ring and currents through the

coil elements are configured so as to couple power through the dielectric chamber wall into the chamber in an annular alternating high and low power (Column 4, line 5 to Column 5, line 25 and Column 5, line 65 to Column 8, line 40 and Column 9, lines 5-50 and Column 12, line 10 to Column 13, line 65).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use antenna with alternating high and low radiation sections as taught by Pu et al in the apparatus as per claims 28-30, 37-39, 58-63 of Patent No. 6,237,526 to minimize eddy currents around the perimeter of chamber wall (Column 2, lines 51-58).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a). A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Rakesh Dhingra


Parviz Hassanzadeh
Supervisory Patent Examiner
Art Unit 1763